Breaking the diffraction limit utilizing anomalous saturation effect in NV centers

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Optical super-resolution microscopy is a promising tool for life science researches. However, most of the techniques require expensive and complex setup, time-consuming post-processing of images and high-power excitation or depletion laser. Here we proposed an approach which can achieve sub-diffraction imaging resolution with simpler system and rapid data-process. The method utilizes quantum defect in diamond: the nitrogen-vacancy center. Due to its anomalous saturation effect which could bring out high frequency information, we demonstrate a simple approach using traditional confocal system and pulsed laser to breaking the diffraction limit. By applying analog modulated AOM, we are able to obtain two profiles with different laser power. Therefore, with subtraction process, high frequency information was extracted, thus we can get a 1.6 folds enhancement of resolution. The using power is lower than STED for the same resolution, and our system avoid the mismatch of two figures when using two laser paths in FED microscopy.

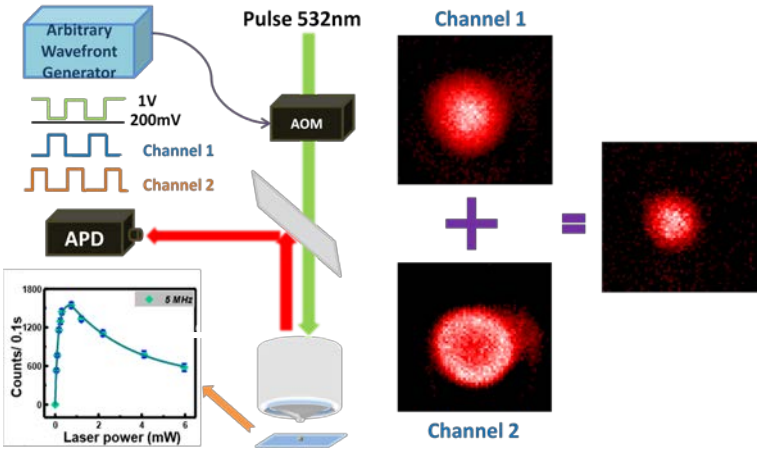

Fig.1. Left: Experimental setup. The inset at the bottom is fluorescence emission of a single NV center with different laser power. Right: Imaging profiles with two channels and the results figure applying subtraction process.

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